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TOBACCO CULTIVATION IN THE SOUTHERN MARATHA COUNTRY

BY

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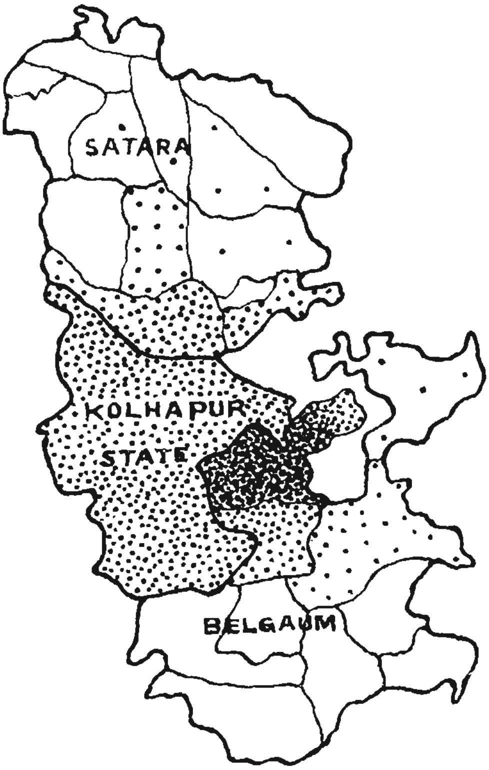
PLATE I

MAP SHOWING THE AREA UNDER TOBACCO, IN SATARA, BELGAUM & KOLHAPUR STATE.



ONE DOT = 100 ACRES.

TOBACCO CULTIVATION IN THE SOUTHERN MARATHA COUNTRY

There is no crop except groundnut, whose cultivation has increased in such a large proportion in the Bombay Presidency in recent years as tobacco. Curiously enough, it is entirely grown for Indian consumption, and chiefly for *local* consumption. There has been and is little or no tendency to grow tobacco suited for the European market, or to cure it by methods which make it suitable for that market. In this respect, the cultivation in Bombay differs from that in Madras, Bengal and Bihar. But yet, the crop is an increasingly common one and is now cultivated over more than 120,000 acres (121,557 acres in 1925-26) in the Bombay Presidency, excluding the very large areas in adjoining Indian States (Baroda, Kolhapur, &c.).

The cultivation of tobacco is concentrated in two areas, where it is an important crop. Elsewhere it is grown on a very small and unimportant scale. The two important regions are (1) Upper Gujarat, where the cultivation centres round the Charotar area, and is chiefly in the Kaira District and the adjoining portions of the Baroda, Cambay and other Indian States and (2) an area in the west of the Deccan and Southern Maratha Country centring round Kolhapur but extending into the Belgaum District on the south and to a less extent into the Satara District in the north. The attached map indicates the spread of the cultivation in these areas according to the latest details available. (Plate No. I.)

It is proposed in the present bulletin to describe the cultivation and treatment of the tobacco as it occurs in the second of these areas, namely, the Western Deccan and Southern Maratha Country. The main information has been collected in the Chikodi Taluka of the Belgaum District, and especially round Nipani, the main centre for marketing and treating tobacco in that District. In considering the methods and results, it is necessary to remember that the purpose in view is not, in any sense, to prepare tobacco which is suitable for cigarettes or for other forms of European consumption. For what is produced, however, there is a large and profitable demand.

II

The area included in what may be called the tobacco area of the Southern Maratha Country, lies in the Satara and

Belgaum Districts and in the Kolhapur and surrounding States. The areas in the smaller States is not available (and are, in any case, relatively small), and in the Kolhapur State it has not been possible to get the figures up to date. But the following areas represent the approximate position at present :—

Belgaum District	...	(1925-26)	43,377 acres.
Kolhapur State	...	(1921-22)	41,950 ,,
Satara District	...	(1925-26)	11,422 ,,

Even within these Districts, the area is very localized. The taluka figures are not available since 1922-23, but the areas in each taluka of the Satara and Belgaum Districts in 1914-15 and 1922-23 are as follows :—

Satara District

Talukas		Area under tobacco	
		1914-15	1922-23
		Acres	Acres
Satara	...	56	79
Koregaon	...	59	84
Wai	...	9	7
Javli	...	...	...
Patan	..	16	31
Karad	...	1,221	1,724
Walva	...	4,743	6,882
Man	...	41	37
Khatau	...	180	308
Khanapur	...	148	219
Tasgaon	...	1,693	2,051
Total	..	8,166	11,422

Belgaum District

Belgaum	...	21	16
Khanapur	...	...	...
Sampgaon	...	70	35
Parasgad	...	34	3
Gokak	...	1,025	1,399
Chikodi	...	21,629	31,525
Hukeri	...	4,802	6,481
Athani	...	311	440
Total	...	27,892	39,899

These figures show how very concentrated the tobacco area is in each of these districts, and how it remains

entrated in the same talukas during the period to which refer. They also show how the crop is becoming more ılar and increasing in area. Taking 1914-15 as the dard, the area in the Satara District had increased by per cent. in 1922-23, and by 30·6 per cent. in 1925-26. he Belgaum District the increase since 1914-15 was per cent. in 1922-23 and by 55·5 per cent. in 1925-26.

III

The cultivation of tobacco in the Southern Maratha Country, both in the Satara and Belgaum Districts and in he Kolhapur and adjoining States, is carried on either in the eep river-side soils along the banks of the Krishna and other ivers, or in black, reddish black, or greyish black soils far rom the rivers, some of which can be irrigated from wells especially in the Satara District) but most of which are not apable of irrigation. It is only on well-drained black soils hat this crop can be taken. According to Mollison, in the atara District the crop is grown to a considerable extent on he greyish coloured soils of old village sites, but we have not een much of this cultivation. The crop is also cultivated to certain extent under garden conditions.

Tobacco grown in alluvial land along the rivers is said o be "*kadak*" and is preferred in the Goa and Vengurla narkets. That from the adjoining black soil, more especially when grown dry, is said to be sweeter, and goes more largely to the Calcutta, Bombay, Madras, Central Provinces and Delhi markets. So far as the Belgaum District is concerned, the tobacco grown round Akkol near Nipani is considered the best, and much from this neighbourhood goes on the market as "*Akkol tambaku*".

Rotations.—Unlike the procedure in Gujarat, tobacco is usually grown in rotation with *jowar* in the areas now under consideration. At and round *Akkol* (Nipani) there is a common three years' rotation, consisting of *jowar*, gram, and then tobacco. Tobacco after gram is considered to give better quality than after *jowar*, and the local people attribute their high quality to this rotation, and to the use of sheep folding as a method of manuring. Another rotation practised near Nipani to a certain extent is *jowar*, *sann* hemp and tobacco, the sann hemp being either ploughed in as green manure, or grown for seed and fibre. In the former case, tobacco follows sann hemp in the same year soon after burying the sann hemp crop, while in the latter, the rotation lasts for

three years. The rotation of tobacco with groundnut or cotton is very rare. Occasionally tobacco is taken after tobacco every year in the Nipani area,—largely owing to the high price in recent years, but this is not considered good practice.

Preparatory tillage.—The method of preparing the land differs somewhat with different rotations. If it follows *jowar*, the land is ploughed as soon as possible after the *jowar* is taken off, and harrowed and re-harrowed many times before the planting time comes. The preparation of land for the tobacco crop is generally very good, and a fine soil, in good tilth to eight inches deep, is a common preparation of land for transplanting tobacco seedlings.

Manures.—In the best local practice in the Chikodi Taluka of the Belgaum District, about ten to fifteen cart loads (8,000 to 12,000 lbs.) of farm yard manure per acre are commonly applied, or 200 sheep per acre are folded on the land for eight days. When sann hemp is used for green manuring, sixty to seventy pounds of the seed are sown by drilling both ways across the field (or by broadcasting) in June, and the crop buried easily in August just before flowering. The ploughed land after burying the sann hemp is levelled by the *kodda* or *samar*—the levelling plank, and the material allowed to rot for two or three weeks. Then the land is prepared for transplanting tobacco by two or three harrowings.

In the Satara District very similar methods of manuring are adopted and the folding of sheep on the land is the favourite practice. There is, however, a very great demand for the sheep available and hence the cost of sheep folding is high. The cost in experiments made in 1915-16 and 1916-17 was Rs. 25 per acre, but equal to that for 10 to 15 cart loads of farm yard manure per acre at the same time. But costs for sheep folding as high as Rs. 82 per acre have been recorded. Costs have gone up very much since that time.

A very extended series of experiments with artificial manures on both irrigated and dry tobacco in the Satara District was carried out in the years 1912-13 to 1916-17*, and the conclusion was reached that *irrigated* tobacco will bear very considerably higher manuring than it is usual to give to it and the best results were obtained with the following

* *See* Bulletin No. 89, Bombay Department of Agriculture,—Mann and Paranjpe—Artificial Manures: Experiments on their value for crops in Western India, No. II, Poona, 1919.

·tificial manures *in addition to* the farm yard manure ordi-ırily used. The artificial manures were :—

(1) Sulphate of Potash ... 150 lbs. per acre.
(2) Superphosphate ... 112 lbs. per acre.
(3) Nitrate of Soda ... 285 lbs. per acre.

The first two manures were mixed, and applied to the nd before planting, and the nitrate of soda was given as a p dressing about one month after planting. These results ›ply chiefly to the lighter forms of black soil, and to land hich is in fairly good condition.

Both in the Satara and Belgaum Districts, experiments ntinued for several years, did not justify the use of artificial manures for tobacco grown without irrigation. The use of oilcake as a top dressing for tobacco in the Nipani area is under trial, and the results are promising, but no definite directions can, as yet, be given.

Preparation of seedlings.—The raising of seedlings in the tobacco growing areas now under consideration is done in a very similar manner to that adopted in other places. They are grown in small beds of about eight feet long by six feet wide, prepared on high level or raised ground with liberal dressing of well-rotted farm yard manure and wood ashes. Each of these beds is divided into two portions, and the seed broadcast in them at an interval of eight days in the second fortnight of July. Tobacco seedlings are subject to many dangers and therefore cultivators are in the habit of raising far more seedlings than they need.

When young, the seedlings are protected from the sun by covering them, usually with straw. Caterpillars (generally, *Agrotis ypsilon*) are carefully searched for in these seed beds and picked off. If rain does not fall, the seedlings are watered every second day. They are considered to be ready for transplanting when they have four leaves and are four inches high from the ground.

Varieties of tobacco.—Little has been done to study the types of tobacco grown in this tract. Most of the tobacco is very similar to the *Gandiu* type of Upper Gujarat.* Several types are, however, recognized by the people and Mollison (1901) described three varieties from Chikodi Taluka of the Belgaum District as follows:—

"*Kari-baglani*—From Chikodi (Belgaum District).—Plant tall, leaf slightly granulated, large, and moderately

* *See* Bulletin No. 132, Bombay Department of Agriculture—Mann, Patel and Muzumdar (1926).

wide: widest one-third length from base, very narrow for two or three inches near base, somewhat spindle shaped, sharp pointed. Midrib fairly prominent, moderately coarse. Veins not coarse and not much reticulated. Texture fairly thick, soft.

Bhopli—From Chikodi (Belgaum District).—Plant tall, leaf slightly granulated, folds double from midrib, characteristically narrow for considerable distance from base, large, long and spindle shaped, sharp-pointed, resembles *sumatra* somewhat in shape. Midrib prominent and coarse. Veins fairly prominent, but not numerous or much reticulated. Texture thicker and coarser than *sumatra*.

Shendi surti—From Chikodi (Belgaum District).—Plant medium height, leaves very slightly granulated, narrow near base, broadest one-third length from base, long, ovate, sharp-pointed. Midrib fairly prominent and fairly coarse. Veins fairly prominent. Reticulations fine. Texture fairly soft, moderately thick."

Of these varieties described in 1901, the second seems now to have disappeared. The first *Kari-baglani* is the common variety of the Chikodi Taluka and is better in quality than *Shendi surti* or (*Lendi surti*) which is also grown. The latter is grown where rainfall is less than in the greater part of the tract.

The fields of tobacco in this as in nearly all the India tobacco areas contain many different types, and (as has been proved in Upper Gujarat) from them very much improved types can be selected, for almost any purpose, if cross-fertilization can be avoided for three or four generations.

Variations in types of the local variety can be marked by the following characters:—

(1) Size and shape of the leaf.
(2) Leaf ratio.
(3) Height of the plant.
(4) Habit of the leaves, such as drooping or erect.
(5) Colour of the leaves and spots on them.

It has been noticed that at least six strains could be easily isolated, if not more, from the local Kari-baglani variety. A tobacco breeding station is under contemplation.

Transplanting.—This very critical operation is usually done in the second fortnight of August, if the rains allow the land to be brought into condition at this time. The distance

between the transplants is usually $3\frac{1}{2}$ feet in both directions, the planting being square. The distance is carefully regulated by strings marked at $3\frac{1}{2}$ feet intervals. At each mark a small hole is made with the *khurpa* (or hoe) and two seedlings are then inserted and watered. A cloudy afternoon is always preferred for transplanting, as it is supposed that the coolness of the following night will allow the transplants to get a hold. Seedlings are carried to the fields from the beds in baskets, and great care is exercised that only well developed ones with straight stems are used. The seedlings are not fully established for three weeks and a man goes round each field every alternate day, to replace those which die.

Interculture and after-treatment.—A tobacco field must be kept clean and this is accomplished in the areas under consideration by the ordinary blade harrow, which is worked in both directions of the field. After each operation the soil round each plant is loosened by a hand *khurpa* (hoe).

The man who loosens the soil at the same time nips the plant and removes side shoots. The centre shoot is, in fact, removed by nipping, leaving seven to nine leaves on the plant. No side branches are, of course, allowed to grow and shoots starting in the axils of the leaves are at once removed.

The harrowing between the plants, loosening the earth round each plant and the removal of side branches are repeated every week or ten days. When the leaves of the tobacco plants get so big as to be damaged by bullock harrowing, the interculture is done by a small hoe drawn by a man.

Irrigation.—Very little of the tobacco in the Belgaum District is irrigated. A large proportion is so treated in the Satara District where it is common to give, if necessary and feasible, one or two waterings of well water. This, however, is not usually done unless the plants are obviously suffering for want of water.

Harvesting.—The crop is ready for harvest when the leaves become slightly hard and yellow in appearance with brownish spots. Tobacco in the Chikodi Taluka (Belgaum District) is usually harvested in the second fortnight of January. Cultivators generally sell their standing crop, leaving it to the purchaser to do the harvesting, or else they harvest it themselves and sell the product when partially dried, on the ninth day after cutting. Of late, at Nipani and in the neighbourhood, the practice of selling the standing crop is becoming more common, and merchants from Nipani or other middlemen make a business of purchasing such crops.

B 1895—3

Harvesting is usually done early in the morning as the leaves are not brittle at this time and so do not tend to break. The plants are cut at the base with a sharp sickle, leaving about four inches of stalk on the plant in the field where the stump usually remains till the end of March. The cut plants, near Nipani, are carefully brought, piled on a country cot to a suitable place in the field and spread in a layer called a *chap*. The man in charge of spreading takes the plants one by one, and places them in lines, the head of one being placed against the head of another plant. In the next layer, the stalks are over the heads of the plant in the layer below. The length, breadth and depth of these *chaps* depend on the quantity of produce in the field. But in any case, it is left without disturbance for seven to nine days. If cloudy weather occurs, the time required is longer, but if there is clear weather the tobacco is either carted home for the preparation of *jarda*, or taken to pits dug in the field for curing.

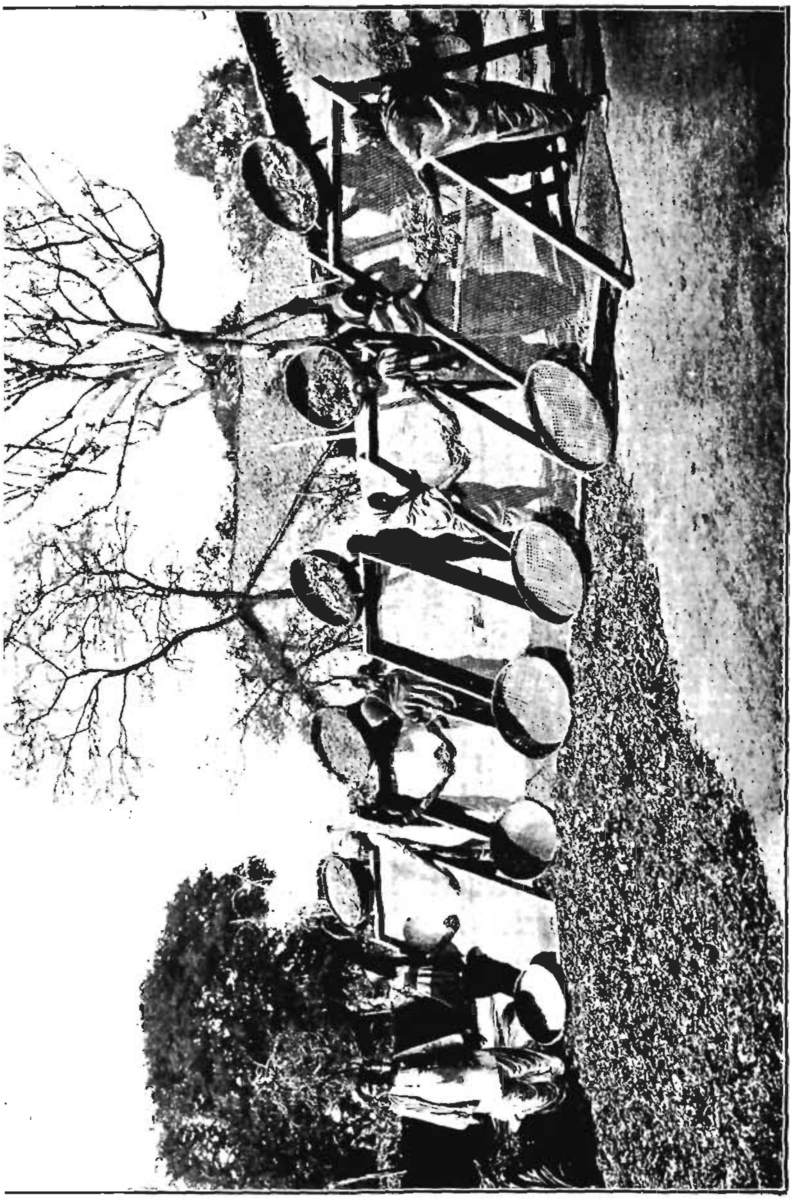
When cultivators harvest the crop themselves, they bring their produce to their house on the ninth day, separate the leaves from the stem, and take the leaves to Nipani market for sale. When merchants or middlemen purchase the standing crop, they cart the material on the ninth day direct to their *wakhars* (godowns) where they prepare *jarda* for smoking or chewing.

The average cost of cultivation, yield and net profits per acre in the Chikodi Taluka are as under:—

Operations	Cost per acre		
	Rs.	a.	p.
Preparatory tillage consisting of ploughing, harrowing, removing stubbles and harrowing again ...	10	0	0
Manure and manuring ...	32	0	0
Raising seedlings ...	4	0	0
Transplanting and filling in gaps ...	6	0	0
Interculture (16 times) ...	12	0	0
Weeding, stirring the soil and removing central and side shoots ...	21	0	0
Harvesting ...	2	0	0
Marketing ...	3	0	0
Total ...	90	0	0

Yields vary from 400 to 750 lbs. per acre, valuing Rs. 130 to Rs. 250. The average net profit in the tract in normal years is Rs. 100 per acre.

PLATE II



Nipani Market. The operation of sieving JARDA through wire sieves.

IV

The preparation of the tobacco for use in the Southern Maratha Country, and in particular in the Belgaum District, is done in two ways chiefly, though there are one or two other minor ways of bringing the material into use. The two chief methods are the preparation of *jarda*, the broken up leaf, etc., used in the making of *bidies* or country cigarettes, and the preparation of bundles of cured whole tobacco leaves. The former method absorbs nearly seventy-five per cent. of the produce that comes to the Nipani market, while about twenty per cent. is sold in the form of bundled leaves. The balance goes in the preparation of one or two other forms, chewing *jarda* or *hatpan* particularly which will be described later.

Preparation of jarda for smoking.—When the plants with all their leaves on them are removed to the house or factory where the further operations are conducted, after nine days exposure in layers in the field, the first operation is to separate the leaves from the stem in the open yard arranged for the purpose. The separated leaves are then allowed to dry in the sun for two or three days, being turned over three or four times by means of a special hand tool known as *dantali*, when sufficiently but not too much dried, the leaf separated from the midribs and large veins, and crushed into small pieces and passed through a series of sieves prepared for the purpose.

Skill in the preparation of *jarda* for smoking lies in breaking up the material into a fine even granular mass without allowing the formation of dust. The proper appearance of the material in its final form is secured by using a large number of sieves from five to eight with different meshes for separating the sizes of leaf granules. Small scale workers use bamboo sieves; those working on a large scale, use wire sieves. (Plate No. II.)

The midribs and large veins of the leaves are also beaten up by sticks into small pieces, and then pounded in a mortar or cut up in a machine, and finally sieved through the same sieves as are used for the leaf fragments. The bigger pieces which are very difficult to reduce to the proper size are kept and often sold separately. The art of making *jarda* largely consists in having the material with exactly the right amount of moisture and in not hurrying the operation. If an attempt is made to go too fast, the proportion of dust is greater, and this means greater loss.

Gentle beating and repeating the operation several times is the secret of successful making of *jarda.*

Preparation of *jarda* on a large commercial scale, as is done in Nipani, with all the operations, *viz.*, crushing the leaves by hand, beating veins and midribs with sticks, and sieving on large scale, is shown in plate No. 3.

The stock of *jarda* thus prepared is sprinkled with water and piled in heaps in the warehouses (*wakhars*). Fermentation takes place and the colour is thus improved. Sometimes the heaps are sprinkled with a decoction of tobacco dust and this improves the colour very markedly and makes it uniform, even the small pieces of the midrib taking on the proper colour. Uniformity of colour is a very great factor in the quality of *jarda*, as well as uniformity of size of grains. The proportion of fragments of midrib and veins is also an important factor, together, of course, with the usual qualities of strength, aroma, thickness of the leaves and regularity in burning.

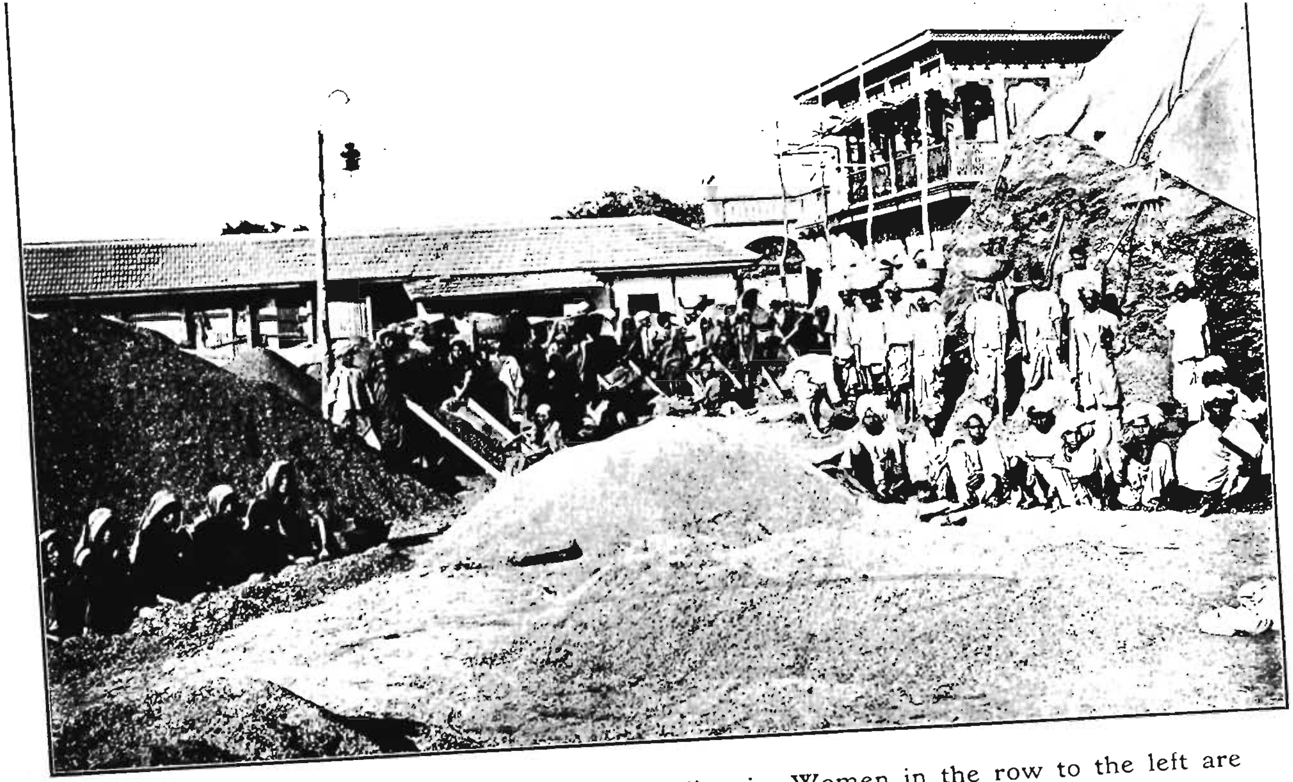
Jarda for chewing.—The preparation of *jarda* for chewing differs little from that already described for smoking *jarda*, but the material prepared is smaller in grain and more uniform. It passes through nine sieves and is not usually mixed with the midribs and large veins of leaves. The material used for making chewing *jarda* has nearly always been kept, after complete sieving through the wire sieves, through a whole monsoon, and is, thereafter, treated as follows:—

> Small lots are taken and sprinkled with decoction of tobacco dust specially made for the purpose till it is all wet and thoroughly mixed. The material is then filled into small baskets, well pressed down and then allowed to stand for twelve to eighteen hours. Then it is taken out, spread in the thin layer and allowed to dry in the shade. The dried material is then again treated similarly, with decoction of tobacco dust, &c., a second time, and if the tobacco is inferior, it is sometimes repeated a third time. This treatment gives a dark brownish appearance to the chewing *jarda.*

When it is fully dried after these operations, it is mixed with various spices and flavours to suit the actual taste of the market. Four preparations are usually made as follows:—

> (1) Ordinary chewing *jarda.*—This is made by mixing the *jarda* with powdered cardamom and nutmeg and then sent out in paper packets.

PLATE III



JARDA making on a Commercial scale at Nipani. Women in the row to the left are crushing Tobacco leaves with the hands. Men in the row to the right are beating the coarse stuff (Mid-ribs and big veins) with sticks.

(2) *Kasturi* or *keshari jarda.*—For this, the *jarda* is sprinkled with infusion of *kasturi* or *keshari* (Musk or Saffron) the whole well mixed and allowed to dry. This kind is always sent out in tins.

(3) *Gulabi* or rose *jarda.*—This is made as indicated under (1), and then rose leaves are placed between layers of *jarda* in tins and kept thus for about a week. Then it is packed and sent out in tins after removing the rose leaves.

(4) *Kyadgi jarda.*—This is made similarly to the rose *jarda* except that *kyadgi* (Screw-pine) leaves are spread between the layers of *jarda* instead of rose petals.

The last two forms of chewing *jarda* are not common. Occasionally other scents are used besides those named, but very rarely.

Curing and Bundling.—While two-thirds of the tobacco grown in the Belgaum and adjoining areas is converted into *jarda* in one form or another, the remainder is cured in the whole leaf and is exported in bundles of leaves chiefly to Vengurla and Goa. The curing of this tobacco is generally done in pits in the fields. The dimensions of these pits vary considerably. For the crops from an acre of tobacco, a pit of about ten feet long, five feet wide, by four feet deep is required. On the early morning of the ninth day after the crop is harvested, the plants are collected and brought to the pits. On the bottom of the pit, Kadbi stalks are spread and the tobacco plants are laid on these with Kadbi straw similarly all round. The pit is filled with tobacco plants thus arranged in layers. It is then covered with a blanket or gunny cover and over this, bundles of Kadbi straw are placed. Above this again, large clods of earth are heaped so that the whole mass is under pressure, the pressure being as nearly equal as possible all over.

After thirty-six hours the pit is opened, the plants taken out and carted home, when bundling is done on the following morning. For this process, men sit in a row and cut the leaves from the plant while it is held upside down. Each leaf is cut with a small portion of the stem, so that the whole stem, except about four inches at the base, goes with the cut leaves. The cut leaves are then dressed by women, who sort them into grades, each grade being kept separately and under pressure for twelve hours. The next day bundling

takes place. This is a somewhat expert business and is done either by contract or for daily wages.

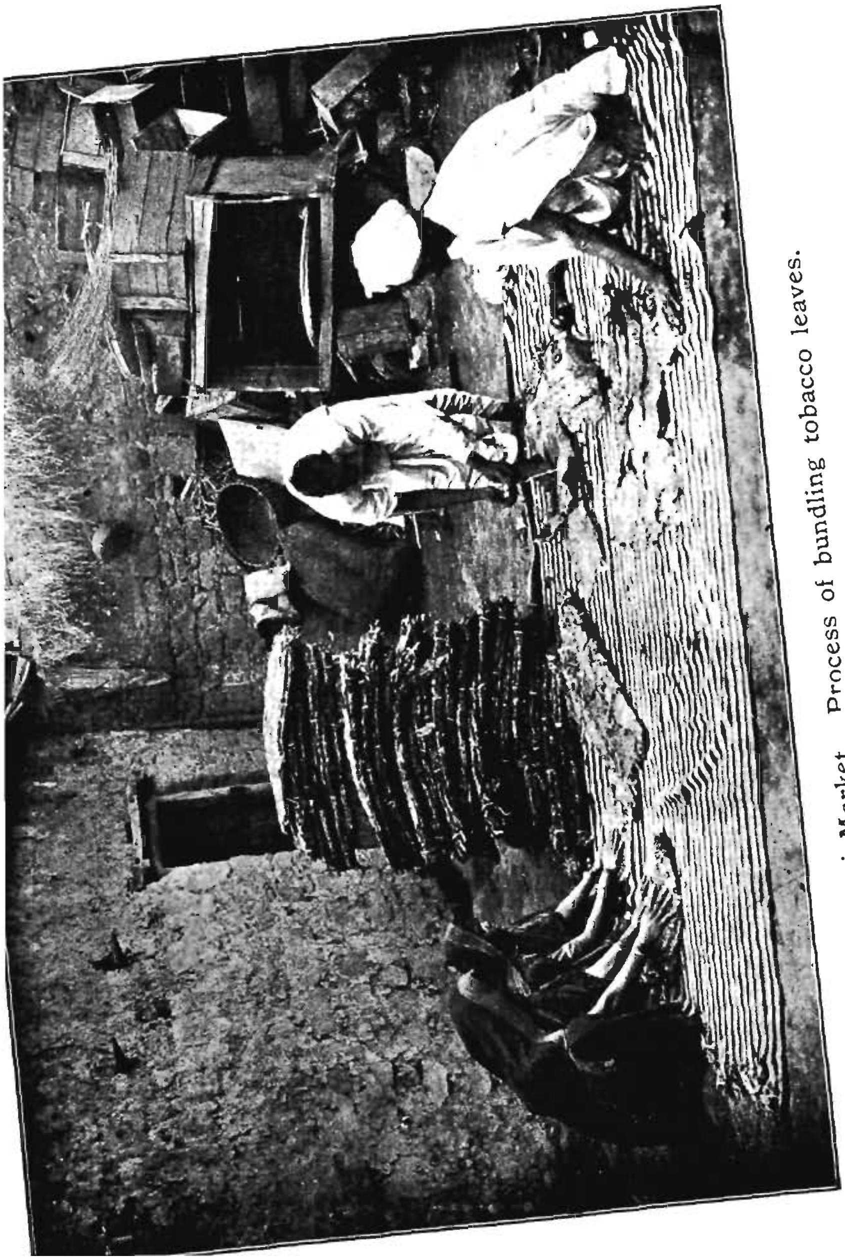
The process consists of preparing bundles of about ten pounds of second rate or inferior leaves with three pounds of fine large leaves three feet long and twenty inches wide on the top and bottom, so that the latter hide the inferior stuff contained in the bundle. The bundle maker spreads a gunny bag on which he places three pieces of straw strings six inches apart. On these strings he spreads entire good leaves of about the size mentioned, with their upper surface downward. He then takes a lot of ten pounds of inferior stuff, and lays the leaves skilfully one by one over the better leaves, leaving a margin of two inches within the edge of the first layer. Then on the top again good large leaves are placed, with their upper side uppermost. Then the whole is well pressed under a piece of gunny, and finally tied up by the strings. These bundles are heaped over one another, and kept pressed for twelve hours, after which they are laid out to dry in the open yard. (Plate No. IV.)

The drying process is peculiar. A layer of *jowar kadbi* is placed on the ground, and over this a layer of prepared tobacco bundles. A layer of *jowar kadbi* comes next, and then a further lot of tobacco bundles. Eight to twelve layers of tobacco are thus arranged in a block, through which air can circulate slowly, so that fermentation and drying can take place at the same time. The heap is taken down and rebuilt every fourth day for twelve days and then every sixth day for a month and a half till the bundles are completely dried. When dry they weigh about nine pounds each, having lost about four pounds during the whole process.

Hatpan.—A small proportion of the tobacco is converted into *hatpan,* only selected leaves being taken for the purpose. The leaves are cut from the stem either before or after pitting (*see* above) preferably before pitting, so that they are not spoiled. A plank is then taken, and on it about thirty to forty leaves are spread over one another, tied together, and kept under pressure for a day after which they are dried as in the method of bundling previously described. (Plate No. V.)

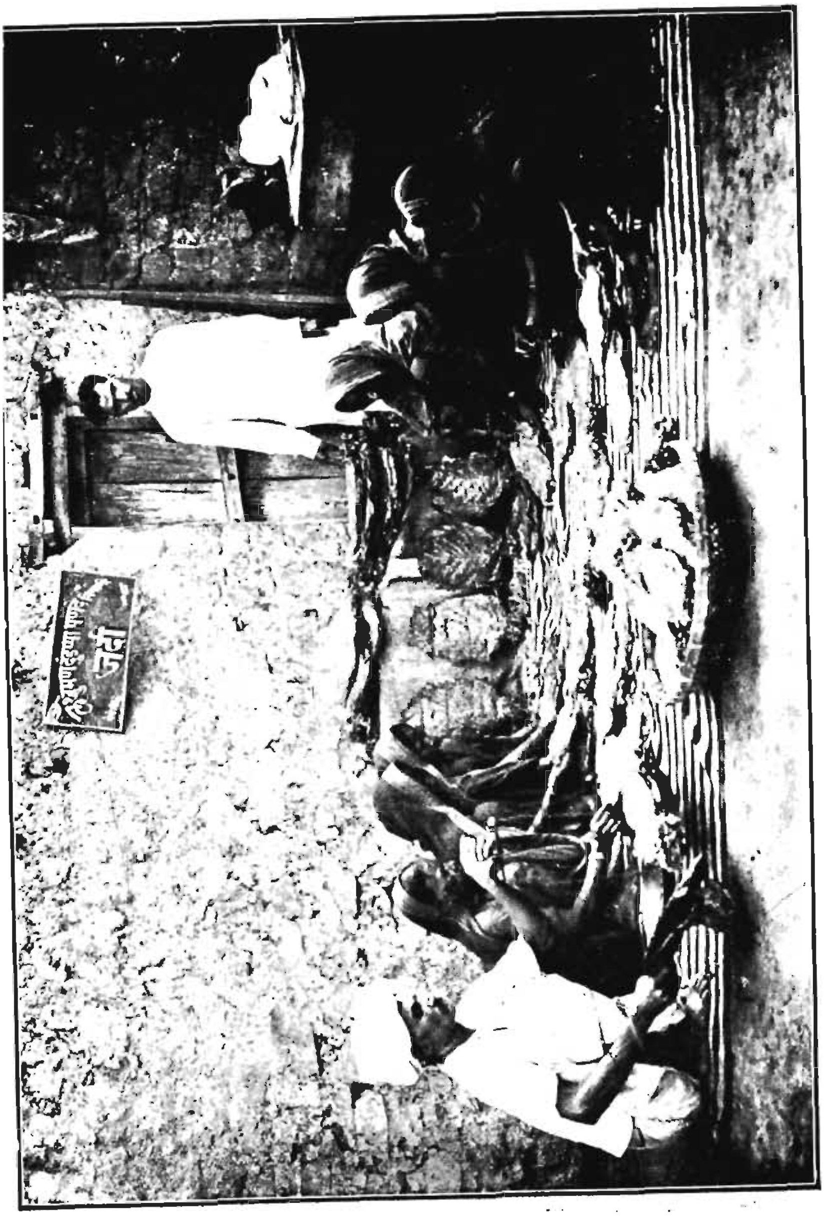
If we take the tobacco which comes to the Nipani market, about seventy-five per cent. is converted into smoking *jarda,* about twenty per cent. into bundles, and the rest (5 per cent.) into chewing *jarda* and *hatpan.* This is the biggest market and though the conditions are somewhat different in other centres in the tract now being described,

PLATE IV



Nipani Market   Process of bundling tobacco leaves.

PLATE V



Nipani Market. Preparing Hatpan.

its conditions may be taken as fairly typical. From Nipani, smoking *jarda* chiefly goes to Calcutta, Madras, the Central Provinces and the Coast Markets. It is usually despatched in gunny bags in the form called *bod* which consists of two ordinary gunny bags stitched together, each of which contains about 252 lbs. (9 maunds of 28 lbs.).

Pieces of the midribs and veins of leaf left after as much as possible has been used in *jarda* making, are sent chiefly to Madras. Tobacco dust which passes through the smallest sieve used in *jarda* making is used partly in preparing the decoction used for sprikling in the preparation of chewing *jarda* and partly goes to Delhi where it is used in *hookah* smoking.

The tobacco prepared by bundling chiefly goes to Goa and Vengurla, though, to a smaller extent, it reaches Belgaum and the east of the Belgaum District (Bailhongal, etc.). Thirty-two bundles as a rule make one package which is covered with toddy mats and despatched.

Hatpan bundles are actually weighed before sale and are similarly despatched wrapped in toddy mats. *Chewing jarda* from the Nipani area chiefly goes to Madras and to Bijapur and the surrounding areas. The manner of packing this has been already described.

Nipani is the biggest tobacco market in the Bombay Presidency where local merchants and *dalals* have built their godowns. The outside merchants or their agents from various places in India come to Nipani market during the season and make their purchases through these local *dalals* and merchants.

These outside buyers do not pay the price of the stuff soon after its purchase. The usual custom is to pay it after a month and a half. The local *dalals* and merchants undertake the risk of their capital, but get interest on it. They receive commission from the cultivator as well as the buyer for their sales. They advance money to the cultivators on the deposit of goods and charge interest. They advance money also to their fellow smaller middlemen who purchase tobacco and prepare *jarda* on condition that it should be sold through them. There are very many middlemen, therefore, in the preparation and sale of the tobacco crop.

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Department of Agriculture

LEAFLET No. 9 OF 1927

Manures for the Tobacco Crop in Gujarat

With the extension of tobacco cultivation, the supply of farm yard manure is already tending to be short and it has become an urgent matter to find a method of manuring which will give a similar yield to the ordinary dressing of farm yard manure at a lower cost and without lowering the quality of the tobacco grown. The most likely method of doing this has seemed to be the use of a green manuring crop and the conditions of tobacco cultivation seem to be such as to be specially suitable for this method.

The complete replacement of farm yard manure with a green manure crop like sann hemp has not been a success both as to yield as well as the quality of the produce.

Farm Yard Manure with Sann Hemp as a Green Manure Crop

A much more profitable use for a green manure crop of sann hemp is to be found in employing it in *partial* replacement of farm yard manure and the results which follow show how far this is likely to be valuable. Two plots were taken up, one with normal dressing, 20 cart-loads of farm yard manure per acre, and the other with half this quantity (10 cart-loads), supplemented by a crop of sann hemp. The actual method of carrying out this system of manuring is as follows:—

> Ten cart-loads of farm yard manure are spread on the land after the first rains, and the sann hemp seed is broadcasted at the rate of 100 lbs. per acre. Then the land is ploughed with the country plough twice, in cross directions and the *samar* or plank taken over the lands. The sann hemp grows vigorously and is ploughed in by an iron turnwrest plough on August 1st. The *samar* is then again taken over the lands. Ten days later the land is prepared for tobacco as usual, and the tobacco is generally transplanted about the last week in August.

The results of this method of manuring on the yield of tobacco, as against the more usual method of adding twenty

cart-loads of farm yard manure per acre, in each of the last five years, are as follows:—

Yield of Tobacco per Acre

		20 carts farm yard manure per acre.	10 carts farm yard manure per acre and sann hemp.
1922-23	...	975 lbs.	967 lbs.
1923-24	...	1,232 ,,	1,283 ,,
1924-25	...	1,488 ,,	1,551 ,,
1925-26	...	1,572 ,,	1,370 ,,
1926-27	...	1,349 ,,	1,334 ,,
Average	...	1,323 ,,	1,301 ,,

It will be seen that the yield in every year except 1925-26, after the treatment was established, was greater or equal with the green manuring treatment to that obtained with the larger amount of farm yard manure. In this year 1925-26, there were no rains for rotting the green manure. There was no difference in the quality of the tobacco produced. By this method the cultivator can at least get similar profits at a saving of cost by Rs. 15 per acre, and this can crop double the area with the tobacco crop with a limited supply of farm yard manure, provided bullock labour, etc., be available.

Concentrated Manure for Tobacco in addition to Farm Yard Manure

Tobacco is the only money crop of the Charotar tract to which the more progressive cultivators have turned. Thus if any concentrated manure which would in every season give higher profits by its application, and if such a manure be easily available, there is considerable scope for its general adoption.

The experiments described below definitely indicate that castor cake is admirably suited for both these purposes, *viz.*, that (1) it increases the profits every year and (2) that it is readily available.

The experiment was first conducted with a heavy dose of the manure, namely, 600 lbs. of powdered castor cake per acre applied at the time of the first irrigation. In the field in which this manure was to be applied only twenty cart-loads of farm yard manure per acre were applied as against thirty cart-loads of farm yard manure per acre. The yields obtained were as follows:—

Yield of Cured Tobacco per Acre

		Farm yard manure, 30 cart-loads per acre.	Farm yard manure, 20 cart-loads, and 600 lbs. castor cake per acre.
1905-06	...	2,298 lbs.	2,457 lbs.
1906-07	...	1,770 ,,	1,988 ,,
1907-08	...	1,102 ,,	1,671 ,,
1908-09	...	1,824 ,,	2,232 ,,
1910-11	...	2,146 ,,	2,328 ,,
Average	...	1,828	2,135

The extra cost at present prices would be only Rs. 10 per acre while the value of extra tobacco, *viz.*, 307 lbs., means an increased return of Rs. 50 to Rs. 60 per acre. However there is a very general impression among the Charotar tobacco growers that castor cake used as manure tends to lower the quality of the resulting tobacco. But this was not the case with tobacco grown at Nadiad with the above treatment, for it was reported that while tobacco manured with castor cake *alone* was inferior, the tobacco produced in the above treatment cured very well.

The above treatment has been more recently repeated in the Borsad taluka and again an equal increase in yield was obtained with no difference in quality.

In order to make certain that the suggested treatment did not lower quality the experiment was again conducted with a smaller dose of castor cake in addition to farm yard manure and applying it earlier, that is to say, a fortnight before transplanting, with the following result:—

Yield of Cured Tobacco per Acre

Year.		Farm yard manure, 20 cart-loads per acre.	Farm yard manure, 20 cart-loads, and 224 lbs. castor cake per acre.
1924-25	...	1,468 lbs.	1,452 lbs.
1925-26	...	1,572 ,,	1,872 ,,
1926-27	...	1,349 ,,	1,682 ,,
Average	...	1,463 ,,	1,669 ,,

Again the extra yield amounts to 206 lbs. per acre worth about Rs. 34 for an extra cost of Rs. 11 only. The quality was again reported by the local purchasers to be similar. This indicates that if a small dose of only about 224 lbs. of castor cake in addition to farm yard manure be applied, the profits are proportionately greater and it is clear that every cultivator can apply, with profit, at least 224 lbs. of castor cake to all of his tobacco fields with certainty of increased profit. This cake may be put on in the powdered form when applied before transplanting, or it can be applied by putting it in a water trough, using the soaked water for irrigation.

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Tobacco as a Crop in the Dharwar District

The extension of the tobacco crop in suitable areas in e Bombay Presidency is eminently to be encouraged, as it , at present, one of the two or three crops which give the rgest money return when grown as a dry crop. At present s cultivation in the Deccan and Karnatak is almost entirely nited to a relatively limited area in the Belgaum and ıtara Districts and in the Kolhapur and surrounding States.

The transition tract in the Dharwar District has now oved itself to be very suited to this cultivation, and the esent leaflet is intended to show the method which has oved successful at the Government Farm near Dharwar. his part of the Karnatak typically belongs to the area known the "transition tract" with an annual rainfall of about irty inches, spread over eight months of the year. This infall is so distributed that there is an average of about re inches before the beginning of June (so-called "ante-onsoon" rain), abont four inches in June, about fifteen ches from July to September, about five inches in October, ıd a few showers later than this.

With a fairly sure and well-distributed rainfall of this nd, and with a soil which is usually deep, lighter in texture wards the west and heavier and blacker towards the east, e transition tract is capable of producing a large variety of *ıarif* and *rabi* crops, the main rotation being cotton and *war*. The tobacco crop, if grown, will probably largely place cotton, though it requires a good deal more care and ouble. It may also serve as a third element in the usual tation, which is recognized as wise by the better cultivators the tract, and in so doing, would replace the present ıcertain crop of potatoes in the *kharif* season followed by heat, or *udid* (*Phasealus mungo*) in the *kharif* season llowed by wheat. Farmers will find tobacco an excellent ıd more reliable substitute for either of these croppings.

But the main purpose which tobacco would serve would ue to replace cotton, and the following figures show how the

actual crop reaped on the Dharwar Farm has compared in cost and profit with the *kumpta* cotton normally grown in the years 1924, 1925 and 1926:—

Kumpta Cotton Crop (Dharwar)

	Weight of seed cotton per acre	Value of seed cotton per acre	Cost of cultivation per acre	Net profit
	Lbs.	Rs.	Rs.	Rs.
1924-25 ...	443	77	19	58
1925-26 ...	603	79	15	64
1926-27 ...	300	42	15	27
Average ...	449	66	16	50

Tobacco Crop (Dharwar)

	Weight of dry tobacco per acre	Value of tobacco per acre	Cost of production per acre	Net profit
	Lbs.	Rs.	Rs.	Rs.
1924-25 ...	511 (Jarda)	93	62	31
1925-26 ...	901 (Bundles)	182	64	118
1926-27 ...	700 (Jarda)	148	78	70
Average ...	704	141	68	73

The net return from tobacco is higher than that from cotton, though the cost of production is also much higher. It leaves the land, however, in much better condition for the following crop.

In general it may be said that if tobacco is valued at Rs. 5 per maund, a little lower than the average of the last three years, it will compete with cotton if the latter brings a price below Rs. 250 per *nug* (1,344 lbs.) of seed cotton.

Methods of Cultivation on the Dharwar Farm

Raising Seedlings of Tobacco.—The site for the seed bed should be so selected that it should be protected from the strong sun in the afternoon. Protection from heavy showers is necessary, as the young seedlings are very small and are easily uprooted by heavy rains. The seed bed should be well raised above the ground and should be manured with well-rotten farm yard manure. The soil should be well pressed before sowing the seed as otherwise the small seed is distributed as the soil sinks at each watering. An ounce of seed over an area of one hundred square feet is enough for transplanting an acre. The seed beds should preferably be long rather than square. Instead of having a seed bed ten feet square it would be better to have one twenty feet long by five feet wide. It is easier to water a narrow bed and weeding and thinning become easier as a man can easily reach the centre of the bed with his hand while sitting on the border.

The seed should be sown in the first fortnight of June, after mixing it well with fine ashes. This gives bulk to the seed and ensures even sowing as the white colour of the ashes indicates the place where the seed has been sprinkled. A fine layer of ashes should again be sprinkled over the bed and the surface should be slightly pressed by a small light plank. The bed should then be watered by a fine spray. The watering should be done very slowly so that there should be no flow of water over the surface of the bed. The slightest flow will make the seed move and collect in the place where the water stands. The seed bed should be watered twice every day, morning and evening. The seed germinates after seven days. The seedlings should be thinned out after six weeks, leaving half an inch space between each plant. They are ready for transplanting by the end of August or beginning of September.

Cultivation of the Crop on the Dharwar Farm.—The land reserved for tobacco should be ploughed six inches deep after the harvest of the previous crop of *jowar*. Well-rotten farm yard manure at the rate of five tons per acre is spread on the surface. It is very essential that the manure should be well-rotten. The land should be harrowed crosswise three or four times after showers and the clods should be broken. The plank should be then worked a day or two before transplanting or even earlier if there are no prospects of rain, as the plank must be worked just after rain as soon as the upper layer of the soil is dry. This makes the soil firm and impedes the movements of wire-worms, the chief pest of tobacco. These beetle grubs move underground in the loose surface soil and eat the stems of transplanted seedlings about half an inch below the surface of the soil. The working of the plank hardens the surface soil and the movements of the grubs are considerably checked.

Transplanting should be done at the end of August or beginning of September. The seed bed should be well watered before the seedlings are uprooted for planting. If the seed is sown in time the seedlings generally have four good leaves and a pair of bottom leaves that are partly damaged or unhealthy. The bottom leaves should generally be removed and the seedlings well examined and all insects found on them destroyed. If the area to be planted is big, the seedlings should be uprooted and supplied in small lots as required. The planters should not hold the seedlings in their hands as they do *chilli* or *brinjal* seedlings, as the

tobacco seedlings are very delicate and the warmth of the hand for any length of time is sure to damage them. Each planter should, therefore, have a small forked twig of some leafy flexible tree. The bifurcated branches should be turned round and tied together. A handful of seedlings should then be placed on the pan made by the twisting of the forked branches, the cut twig serving the purpose of the handle.

Planting is done three feet apart both ways. The field is first marked by a drag locally called Yadak with three or four tines three feet apart. The drag is drawn crossways over the flat field as straight as possible and planting is done at points where the marks of the tines cross. This gives fairly straight planting and accurate spacing. A man first makes holes with a small pick or *kurpi*. Another man pours a small quantity of water in the holes after which the planters begin planting. The quantity of water used at the time of transplanting should only be just enough to make the soil surrounding the stem and the roots moist.

It must be remembered that tobacco planting is quite different from chilli planting. In the latter case two seedlings are pressed in the soil by the finger. Such a thing will be wholly destructive for tobacco seedlings. Tobacco stems are very tender and brittle and will either break or get bruised. The finger should, therefore, first be inserted in the soil and the seedlings should then be put in and the soil slightly pressed around, care being taken to see that no dry soil comes in contact with the stem. Unlike chillies only one seedling is planted in case of tobacco. Planting should preferably be done in the evening, to avoid exposure to the sun immediately after planting. For about a week after planting the plants droop in the evening and revive in the morning. The field must be carefully examined two or three times a week early in the morning.

The plants that remain drooping even in the morning should be examined. They are generally damaged by insects or in a few cases damaged while planting. Such plants should be replaced by fresh ones. This work continues more or less for a month though the number of dead plants goes on diminishing at each successive inspection. All beetle grubs, beetle or other insects found at the stem, should be picked up and destroyed. The wire-worm which is the most destructive insect is generally found at a distance of about an inch from the stem in the soil and should be carefully searched for.

The first interculturing should be given three weeks after planting and, in all, the crop should be hoed as many times as possible. After each hoeing the soil round the stem should be well stirred by *kurpi* and the leaf just near the ground should be removed. The plants should have clean stems to a height of about three inches from the soil after which the leaves should be allowed to grow. This makes hand working round the stem easy, and prevents the leaves from spreading on the ground, which damages their quality. By the middle of October the plants are ready for topping. Each plant should have nine to eleven good leaves after which the top should be pinched off. The pinching off the top is known as topping. All plants are not ready for topping at the same time as all plants are not of uniform growth and, therefore, the operation continues up to the middle of November. After topping, the plant produces side shoots at the exils of the leaves. These must be removed every week and the soil well stirred by the *kurpi*. These operations continue up to the end of January when the crop is ready for harvest. The growth of the side shoots is very vigorous in October and November when more attention is necessary. The leaves begin to turn yellow in January and the surface of leaves becomes wrinkled. Rusty eye-like spots develop afterwards. When all leaves show these symptoms they are mature and the crop is ready for harvest.

Harvesting.—The crop is cut by the end of January or early in February. Harvesting is usually done early in the morning as the leaves are not brittle at this time and do not tend to break. The plants are cut at the base with a sharp sickle. If the produce is to be turned into bundles, as will be usually the case, the collected plants are put into freshly dug pit in the ground about four feet deep and big enough to take the whole produce. *Jowar* straw (*kadbi*) is laid at the bottom of the pit, and after the cut plants are placed carefully in layers over this, a layer of *jowar* kadbi is put on the top and the whole covered with earth. The pit is then left for forty-eight hours, and then opened and the plants taken out and carted to a house for bundling.

The actual method of preparation for the market in the Southern Maratha Country is described in Bulletin No. 140 (Bombay Department of Agriculture, 1927) but usually it is possible to sell the pitted tobacco to professional curers who prepare it for the market.

Any further information can be obtained from the Superintendent, Government Farm, Dharwar.